FIG. 1

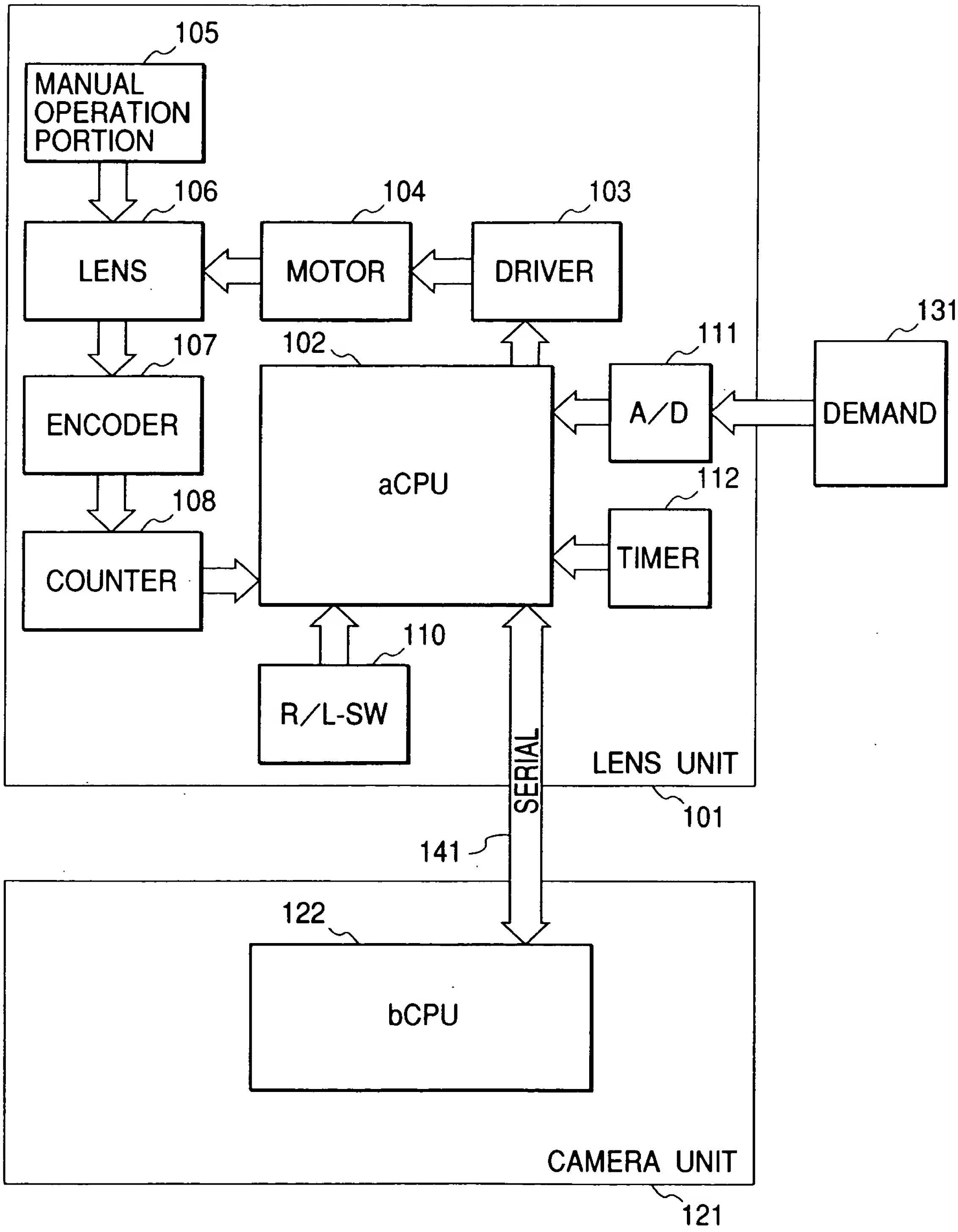

105
MANUAL OPERATION PORTION
106
LENS
104
MOTOR
103
DRIVER
107
ENCODER
102
aCPU
111
A/D
131
DEMAND
108
COUNTER
112
TIMER
110
R/L-SW
SERIAL
LENS UNIT
101
141
122
bCPU
CAMERA UNIT
121

FIG. 2

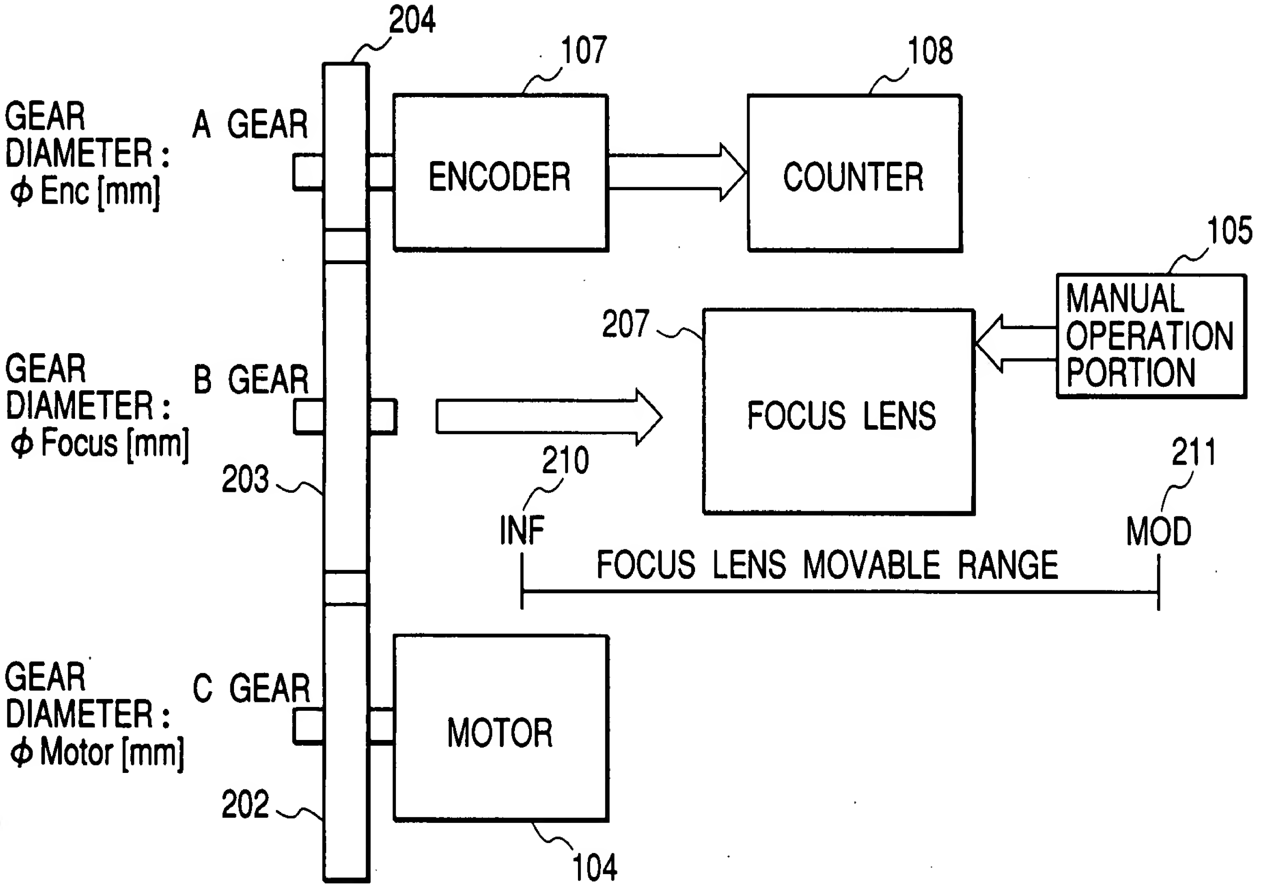

204
107
108
GEAR DIAMETER : φ Enc [mm]
A GEAR
ENCODER
COUNTER
105
MANUAL OPERATION PORTION
207
FOCUS LENS
GEAR DIAMETER : φ Focus [mm]
B GEAR
203
210
INF
211
MOD
FOCUS LENS MOVABLE RANGE
GEAR DIAMETER : φ Motor [mm]
C GEAR
MOTOR
202
104

FIG. 3

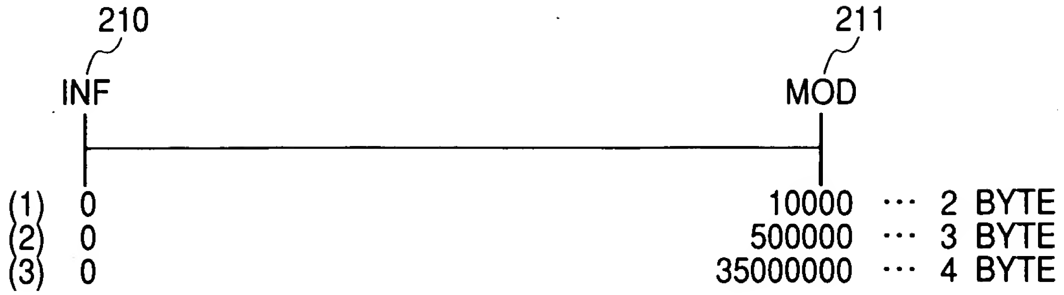
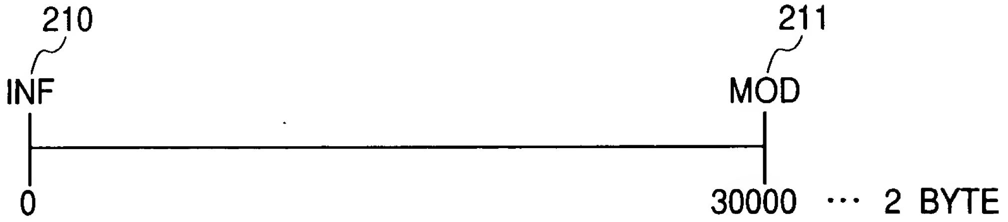


FIG. 4



NECESSARY RESOLUTION
FOR FOCUS POSITION
NTSC : 1/5000
HD : 1/20000

FIG. 5

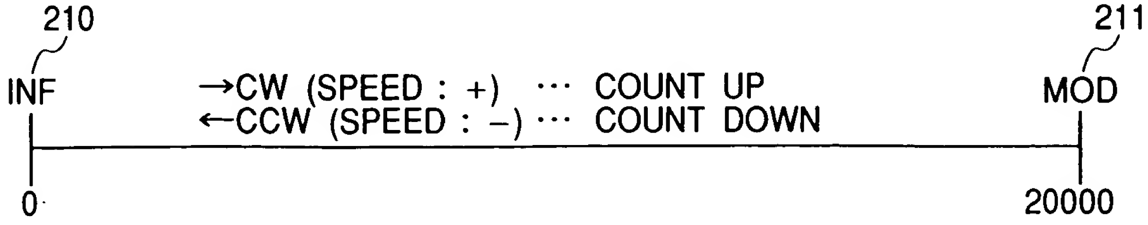


FIG. 6

OUTPUT PULSE NUMBER PER ONE ROTATION OF ENCODER 2500		PPEnc [P/R]	
MOTOR GEAR DIAMETER ϕ Motor [mm]	ENCODER GEAR DIAMETER ϕ Enc [mm]	COUNTER PULSE NUMBER PPTotal [pulse]	
		MOTOR ROTATION NUMBER FROM INF TO MOD	
		NRot=20	NRot=100
20	20	50000	250000
20	10	100000	500000
5	20	12500	62500

FIG. 7

OUTPUT PULSE NUMBER PER ONE ROTATION OF ENCODER 2500		PPEnc [P/R]	
MOTOR GEAR DIAMETER ϕ Motor [mm]	ENCODER GEAR DIAMETER ϕ Enc [mm]	COUNTER PULSE NUMBER PPTotal [pulse]	
		MOTOR ROTATION NUMBER FROM INF TO MOD	
		NRot=20	NRot=100
20	20	200000	1000000
20	10	400000	2000000
5	20	50000	250000

FIG. 8A

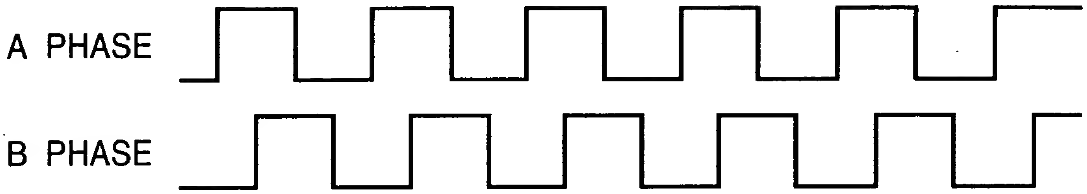


FIG. 8B

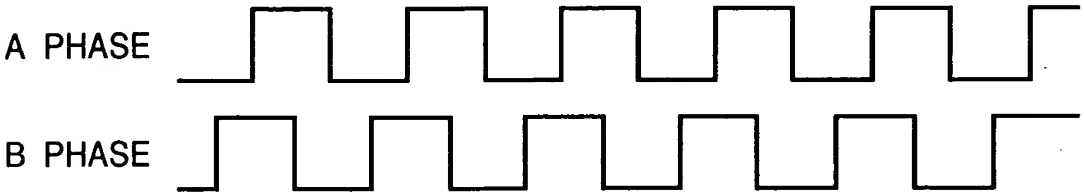


FIG. 9

WHOLE RANGE NORMALIZED POSITION : 30000

SPEED COMMAND V SYNCHRONIZING UNIT	SPEED COMMAND CHANGING RATIO [%]	WHOLE RANGE MOVEMENT TIME [sec.]
1	100.00	500.00
2	50.00	250.00
3	33.33	166.67
4	25.00	125.00
5	20.00	100.00
6	16.67	83.33
7	14.29	71.43
8	12.50	62.50
9	11.11	55.56
10	10.00	50.00
⋮	⋮	⋮
25	4.00	20.00
26	3.85	19.23
27	3.70	18.52
28	3.57	17.86
29	3.45	17.24
30	3.33	16.67
31	3.23	16.13
32	3.13	15.63
33	3.03	15.15
34	2.94	14.71
⋮	⋮	⋮
1635	0.061	0.306
1636	0.061	0.306
1637	0.061	0.305
1638	0.061	0.305
1639	0.061	0.305
1640	0.061	0.305
1641	0.061	0.305
1642	0.061	0.305
1643	0.061	0.304
1644	0.061	0.304

SPEED COMMAND CHANGING RATIO IS CONSIDERABLY LARGE

SPEED COMMAND CHANGING RATIO IS WITHIN 5%

FIG. 10

		WHOLE RANGE MOVEMENT TIME [sec.]		
SPEED COMMAND V SYNCHRONIZING UNIT	SPEED COMMAND CHANGING RATIO [%]	WHOLE RANGE NORMALIZED PORTION 30000	WHOLE RANGE NORMALIZED PORTION 500000	
1	100.00	500.00	8333.33	SPEED COMMAND CHANGING RATIO IS CONSIDERABLY LARGE
2	50.00	250.00	4166.67	
3	33.33	166.67	2777.78	
4	25.00	125.00	2083.33	
5	20.00	100.00	1666.67	
6	16.67	83.33	1388.89	
7	14.29	71.43	1190.48	
8	12.50	62.50	1041.67	
9	11.11	55.56	925.93	
10	10.00	50.00	833.33	
⋮	⋮	⋮	⋮	
25	4.00	20.00	333.33	SPEED COMMAND CHANGING RATIO IS WITHIN 5%
26	3.85	19.23	320.51	
27	3.70	18.52	308.64	
28	3.57	17.86	297.62	
29	3.45	17.24	287.36	
30	3.33	16.67	277.78	
31	3.23	16.13	268.82	
32	3.13	15.63	260.42	
33	3.03	15.15	252.53	
34	2.94	14.71	245.10	
⋮	⋮	⋮	⋮	
1635	0.061	0.306	5.097	
1636	0.061	0.306	5.094	
1637	0.061	0.305	5.091	
1638	0.061	0.305	5.088	
1639	0.061	0.305	5.084	
1640	0.061	0.305	5.081	
1641	0.061	0.305	5.078	
1642	0.061	0.305	5.075	
1643	0.061	0.304	5.072	
1644	0.061	0.304	5.069	
⋮	⋮	⋮	⋮	
27365	0.004	0.018	0.305	SPEED COMMAND CHANGING RATIO IS SUBSTANTIALLY EQUAL TO 0%
27366	0.004	0.018	0.305	
27367	0.004	0.018	0.305	
27368	0.004	0.018	0.304	
27369	0.004	0.018	0.304	
27370	0.004	0.018	0.304	

FIG. 11

SPEED COMMAND V SYNCHRONIZING UNIT	SPEED COMMAND CHANGING RATIO [%]	WHOLE RANGE MOVEMENT TIME [sec.]	
		WHOLE RANGE NORMALIZED PORTION 1000	WHOLE RANGE NORMALIZED PORTION 500000
1	100.00	16.67	8333.33
2	50.00	8.33	4166.67
3	33.33	5.56	2777.78
4	25.00	4.17	2083.33
5	20.00	3.33	1666.67
6	16.67	2.78	1388.89
7	14.29	2.38	1190.48
8	12.50	2.08	1041.67
9	11.11	1.85	925.93
10	10.00	1.67	833.33
⋮	⋮	⋮	⋮
33	3.03	0.505	252.53
34	2.94	0.490	245.10
35	2.86	0.476	238.10
36	2.78	0.463	231.48
37	2.70	0.450	225.23
38	2.63	0.439	219.30
39	2.56	0.427	213.68
40	2.50	0.417	208.33
41	2.44	0.407	203.25
42	2.38	0.397	198.41
43	2.33	0.388	193.80
44	2.27	0.379	189.39
45	2.22	0.370	185.19
46	2.17	0.362	181.16
47	2.13	0.355	177.30
48	2.08	0.347	173.61
49	2.04	0.340	170.07
50	2.00	0.333	166.67
51	1.96	0.327	163.40
52	1.92	0.321	160.26
53	1.89	0.314	157.23
54	1.85	0.309	154.32
55	1.82	0.303	151.52
56	1.79	0.298	148.81
57	1.75	0.292	146.20
58	1.72	0.287	143.68
59	1.69	0.282	141.24
60	1.67	0.278	138.89

SPEED COMMAND CHANGING RATIO IS CONSIDERABLY LARGE

IN CASE THAT NORMALIZED POSITION IS "1000", SINCE SPEED COMMAND CHANGING RATIO IS CLOSE TO "2%", SPEED COMMAND IS EASY TO DEAL WITH

FIG. 12

V SYNCHRONIZING UNIT = 1/60 (sec.)

	NORMALIZED SPEED COMMAND 50 [STEP/V SYNCHRONIZING UNIT]	
	WHOLE RANGE NORMALIZED POSITION FOR SPEED COMMAND	WHOLE RANGE MOVING TIME [sec.]
HIGH SPEED MOVEMENT SPEED COMMAND	1000	0.33
MIDDLE SPEED MOVEMENT SPEED COMMAND	30000	10.00
LOW SPEED MOVEMENT SPEED COMMAND	500000	166.67

FIG. 13